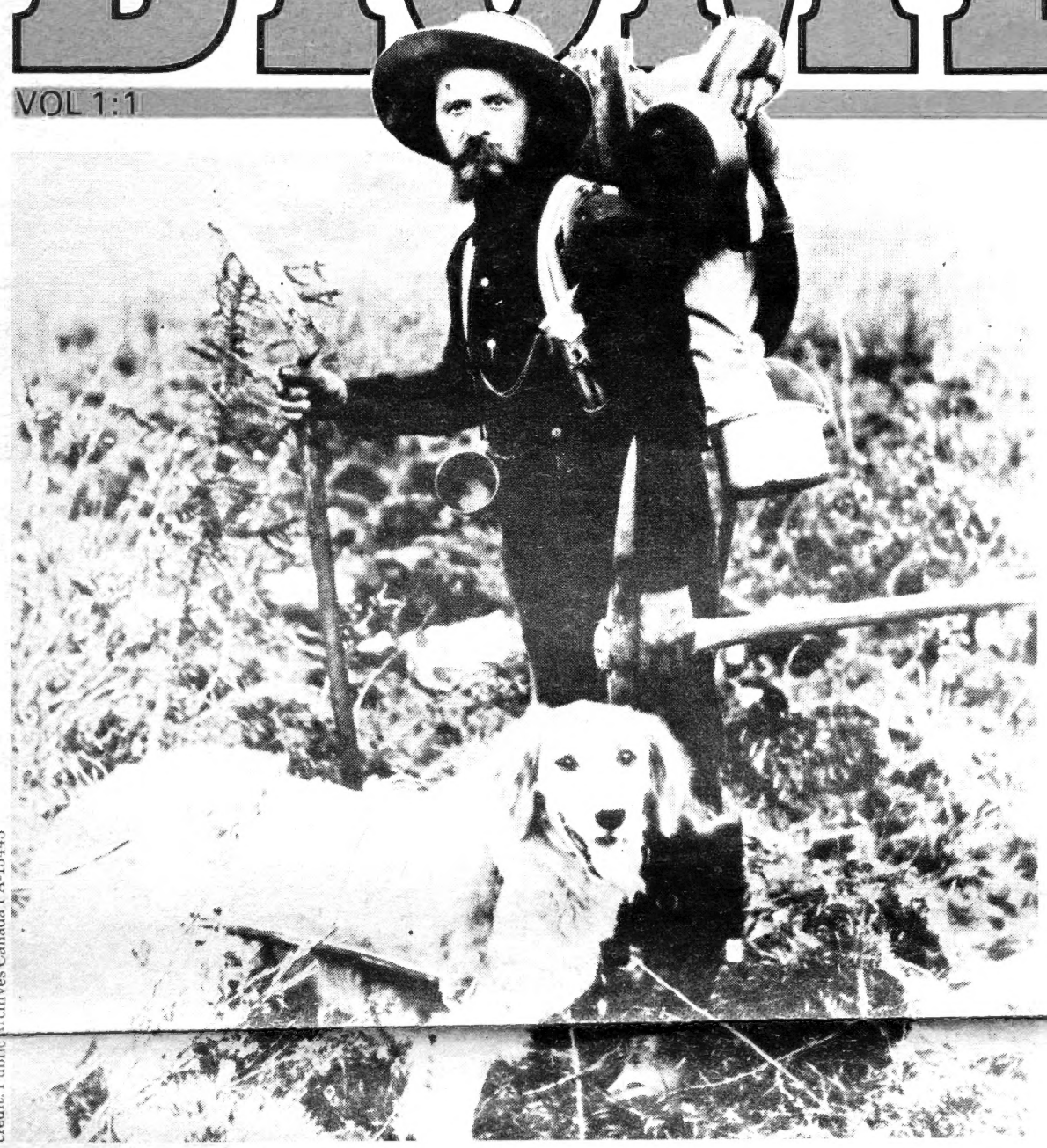
BIOME

National Museum of Natural Sciences

VOL 1:1



credit: Public Archives Canada PA-13443

To get to the Klondike prospectors carried enough supplies for a year over mountain passes and down the wild rapids of the Yukon River. Many braved snowslides and other hardships to reach water before spring breakup, and when the ice finally broke, some 8000 boats set sail for Dawson.

Our mineral life

Where would we be without minerals? It's hard to imagine such a thing, for the use of minerals is as old as civilization. In North America we depend heavily on products made from minerals, yet how they get to us is a process we take very much for granted.

Although we may feel detached from the mining industry, we are all affected by it. Look around our homes and we see mineral products everywhere: stoves, refrigerators, toasters, cutlery, pipes, bathroom fixtures, telephone wires, cars. The list goes on and on.

As well as these obvious products, there are many more hidden influences of the mining industry. The lumber we use to build our houses and furniture has been cut and processed by [illegible] the daily newspaper would not exist without minerals; the farmer's tractor and cultivator are made from metal products and are powered by petroleum products. The network of transportation and communication systems that link our country with the rest of the world uses huge amounts of copper, lead, zinc, nickel, iron ore, titanium, non-metals such as gravel, sand and asbestos, as well as petroleum products. It's not surprising that minerals are called the building blocks of civilization.

As the second-largest country in the world, Canada is particularly rich in mineral and fuel resources. About 60 different minerals are produced in Canada and almost one-third of the total value of our exports is from these resources. Canada is the Western World's leading producer of nickel, zinc, asbestos, nepheline syenite and potash, and the second largest producer of gold, silver, columbium, gypsum, molybdenum, selenium, titanium and uranium.

Where would we be without minerals? In a recent survey of Canadian attitudes toward the [illegible] tries, only a quarter of the people contacted saw mining as being important to Canada's future prosperity. Yet the products of minerals are everywhere. And even in a future heavily oriented toward conservation, they will play a large part in our lives.

Golden Memories

Today if you decided to head out with a pack horse and a supply of food to find gold in the wild rivers of the West, friends might think you were crazy. And, indeed, your chances of striking it rich would be pretty slim.

But for the thousands of men who poured into British Columbia and the Yukon in the 1800s, sudden fortune seemed like a very real possibility. In 1859, when news of gold in the Fraser River first reached the miners of the dwindling California goldfields, it was certainly reason enough for many to drop whatever else they were doing and head North.

Soon, a steady stream of men were pushing their way up the Fraser River and its tributaries, testing each sandbar and stream for flakes or chunks of gold, called placer gold, that had been worn away from the parent rock and carried downstream by the action of the current. The golden treasure could be recovered by panning, scooping up a mixture of gravel, sand and water, and pouring it off until the heavier metal was left where it had sunk to the bottom. Many enterprising miners built sluice boxes, troughs which carried the water, sand and gravel over wooden barriers and trapped the gold inside.

Within a few years, prospectors had travelled over 1,000 kilometres inland to a part of British Columbia called the Caribou. Here the flakes and chunks of gold were larger and less water-worn, an indication that they were approaching the veins from which the gold had broken, dubbed by miners the "mother lode". Excitement mounted. Streams in this new area were rich beyond imagining — one had been found that produced gold worth a hundred dollars with each panning.

Before long, six thousand miners had swarmed to the Caribou. The town of Barkerville had appeared and a road was begun that would cut through the mountains to the centre of mining country. By the time pay dirt began to dwindle in 1871, 25 million dollars worth of gold had been taken out of the Caribou, and a new territory had been opened up for settlement, a territory that would yield other minerals and become prime B.C. ranching country.

For a few decades the gold fever abated. Then, in 1897,

Continued on page 3

GOLD NUGGETS

The largest gold nugget ever recorded was found in Australia; it weighs 68 kg.

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Gold is the most malleable and ductile of metals; it can be hammered into foil 0.00001 cm thick and a few grams of the metal can be drawn into wire several kilometres long.

•

Gold is highly valued for more than its beauty — it is precious because it is very rare. It has been estimated that all of the gold recovered in the past 500 years would weigh about 50,000 tonnes, an amount that because of gold's high specific gravity, could be contained in a cube measuring about 15 metres.

•

South Africa is the world's largest producer of gold. Yet even in the most productive mines over 150,000 tonnes of ore are recovered to produce a tonne of gold.

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Gold has been continually reused over the ages, resulting in the destruction of many important works. Thus a gold tooth crown used by your dentist might contain some gold from a piece of jewellery worn by an Egyptian queen 3000 years ago.

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Prospectors who worked placer deposits by the Black Sea around 1200 B.C. recovered gold by trapping the metallic particles in sheep's fleeces placed in a crude sluice box. The fleeces were hung to dry in nearby trees and later shaken to collect the gold.

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To make gold from baser metals was a major preoccupation of alchemists. A thousand years of experimenting with every conceivable mixture and potion gave us the basis for modern chemistry.

•

An early theory held that gold deposits were formed under the celestial influence of the sun. In 1492, as he approached Cuba, Columbus wrote in his journal, "From the great heat which I suffer, the country must be rich in gold."

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Historically gold was used for decoration and circulated as money. Today, in addition to its uses in jewellery and as an international monetary standard, gold is being increasingly used for industrial purposes, particularly in electronics and electrical engineering industries.

•

For more details and ancient lore about gold, see the introduction to *The Geochemistry of Gold and its Deposits*, by Robert W. Boyle, Geological Survey of Canada, Bulletin 280.

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The Gold Maple Leaf, issued by the Royal Canadian Mint, is a legal tender coin. It contains one troy ounce of pure gold and sells at market value plus a small commission.

credit: Royal Canadian Mint

EDITORIAL

Searching for Buried Treasure

You have in your hands the first issue of BIOME, a "nature newsletter" published by the National Museum of Natural Sciences. It is the product of a team of museum scientists and interpretive writers, who seek to shed some light on the natural sciences and generally demystify science for you. We'll be talking about geology, paleontology, botany, mammals, birds, fish, reptiles, amphibians and invertebrates, and of course the interactions among these plants and animals and their environments. We will be emphasizing the points of view of our own specialists, taxonomists mostly, but we'll also consider those of ecologists, urban planners, etc.

Why BIOME for a title? Because the word refers to an ecological concept that is broad enough to cover the wide range of subjects we will delve into for our mutual enjoyment. As a bonus, "biome" in english is "biome" in french — a small gesture that shows our interest in both english- and french-speaking readers.

Finally, this newsletter will be for everyone: young and old, the dedicated amateur and the just plain curious. We will strive to entertain you and inform you of the important happenings in the natural sciences, always aiming for scrupulous scientific accuracy (our museum scientists are notoriously particular about the facts).

Since this is our first issue, we would appreciate knowing what you liked and what you would like to see changed. Don't hesitate to send your suggestions, in writing, to our editor-in-chief:

Elisabeth Marsollier,
National Museum of
Natural Sciences,
Ottawa, Ontario K1A 0M8.

E.M.

BIOME*

Editor-in Chief:
Dr. Elisabeth Marsollier

Editor/Writer:
Carol Thiessen

Scientific Advisors:
R. Williams
Dr. J.D. Grice
L. Moyd
R. Gault

Acknowledgements:
Dr. R.W. Boyle
R. Dufour
Dr. P.J. Hood
D. Hoy
P. Neary
C. Rother
The Geological Survey of Canada

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Art Direction:
Norman Takeuchi
Design and Technical Services, NMC

Graphics:
Danielle Dupont
Design and Technical Services, NMC

Gilles Huneault

* BIOME *is a complex and still evolving concept, but for convenience's sake we define it as a distinctive natural combination of plants and animals with a characteristic climax vegetation life form, e.g. coniferous forest, tundra, desert, tropical forest.*

NATIONAL MUSEUM OF NATURAL SCIENCES

NATIONAL MUSEUMS OF CANADA

Prospecting — the word sparks images of a grizzled individualist, pick in hand, probing for riches in the wilderness, pushing into the back country on foot, horseback or canoe. The image was well-earned by those who searched for mineral deposits in pioneer days.

But for today's prospector the picture has changed. Although many important mineral deposits have been found in rocky outcroppings at the earth's surface, a few hundred years of diligent searching has uncovered most of these. Today's treasure-hunters look for deposits well below the surface rock. And in a country that covers almost 10 million square kilometres, finding ore deposits of one square kilometre is like looking for a needle in a haystack.

To solve this problem of geography, Canadian geoscientists have become pioneers of a different sort — and have developed airborne survey techniques that are being adopted all over the world.

To detect what lies beneath the earth's surface, scientists make use of geology, physics and chemistry. They rely on the fact that most mineral deposits have distinctive physical properties — electrical conductivity, magnetism or radioactivity — which distinguish them from the rocks in which they are enclosed. Geophysical instruments, sensitive enough to detect even very small changes in a specific physical property, are mounted in aircraft and flown at low altitudes over large areas to find locations where more detailed surveys might yield results.

One such instrument is called a magnetometer. It measures small changes in the earth's magnetic field and thus detects the presence of some types of orebodies. Another instrument detects and measures the radioactive gamma-rays produced by uranium.

Following the discovery of anomalies by airborne techniques the next step in modern prospecting is usually a ground survey to investigate the cause. In this phase scientists use many of the same geophysical instruments they used in the air. They may also carry out geochemical surveys to measure traces of elements in soils, stream sediments, outcropping rocks, or even vegetation.

If ground surveys confirm the presence of ore deposits below the surface, the final step in the exploration program is to drill holes into the body causing the anomaly. Samples are then assayed to determine what elements are present and in what percentage.

It may sound simple, but the search for treasures beneath the earth only occasionally leads to the development of a mine. In fact, records show that only one in every 1000 exploration projects does become a mine. Yet, just as in days past, the dream of making a new discovery keeps prospectors ever-hopeful, and the search goes on.

On the Crystal Trail

To the uninitiated it seems an unlikely place to attract world attention for fine mineral specimens — an unassuming rock quarry east of Montreal. Yet the crushed stone operations of Mont Saint-Hilaire have uncovered deposits of some very rare crystals and contain an exceptional diversity of mineral species.

For mineralogists at the National Museum of Natural Sciences, the site is an important one. In their search for minerals to add to the museum collection they have been lucky to have Saint-Hilaire so close to home.

When blasting operations uncovered part of a pegmatite dyke beneath the quarry floor, operators phoned museum scientists in Ottawa. By excavating around the dyke, they were able to recover quantities of serandite crystals that are by far the finest specimens in the world.

The crystals are among those displayed as part of Canada's National Mineral Collection, a collection which it is hoped will one day contain specimens of each of the 2500 or so minerals known. Exceptional specimens like the serandite crystals also provide scientists with excellent exchange material. And in the competitive world mineral trade, it's worth a lot to have something that somebody else wants.

In fact, building a national collection of minerals is not easy, and curators use "all legal means" to acquire important specimens. Like the sleuth in search of clues, they must always be on the alert for tips — an inadvertent mention in a geologist's report, an advertisement in a trade magazine, or an unusual mineral sent to the museum for identification. Often miners or quarry operators call museum curators to collect crystals that will otherwise be destroyed.

The search for specimens has taken the scientists to Scot's Bay, Nova Scotia; the Jeffrey Mine in Quebec; Bancroft, Ontario; and the mountains of Yoho National Park.

Recently they travelled to the wilderness of Baffin Island to collect some 20 different mineral species and examine a deposit of the exotic and ancient decorative stone, lapis lazuli.

And sometimes the search leads back to familiar ground — and new species or very rare minerals show up almost at your own back door.

To collect serandite crystals, mineralogists excavated 2.4 metres into the quarry floor at Mont Saint-Hilaire.

Chronicles of a Mining Town

The picture shows a shift of Bell Island miners beginning the journey to their workplace, "the dark unfathomed caves of ocean." Bell Island, a huge rock rising from the depths of Conception Bay in Newfoundland, was once an integral part of the fishing economy of the area. In 1895 the Nova Scotia Coal and Steel Company began to mine the island's vast iron ore reserves.

The traditional outport community was soon transformed, in appearance anyway, into a typical company town of its vintage, with a company store, staff house, shacktown, east mines, west mines, and compressor hill. Though the residents of Bell Island kept much of their traditional culture and spirit, their material lives were profoundly influenced by the mining boom and affected by decisions made far beyond their shores.

The earliest mining in Bell Island was an open pit operation, but eventually "stopes" were dug from the island into the great bed of iron ore that ran beneath the floor of Conception Bay. By the 1960s Bell Islanders were working more than three miles out under the ocean.

It took great mettle to spend the day beneath the waves, in an environment that was damp, leaky and dark. Although the mines were relatively safe, pumps ran continuously to prevent them from flooding. Even so, when miners came to the surface, every visible part of their body was red from the iron and their clothes were usually soaked.

Ballads like the one that follows, composed in the outport tradition, give some insight into the attitudes of Bell Island "muckers" towards their new working environment.

Ye men that works down
in this cave,
Your courage must be
more than brave,
To work a mine beneath
the wave,
Wabana you're a corker.

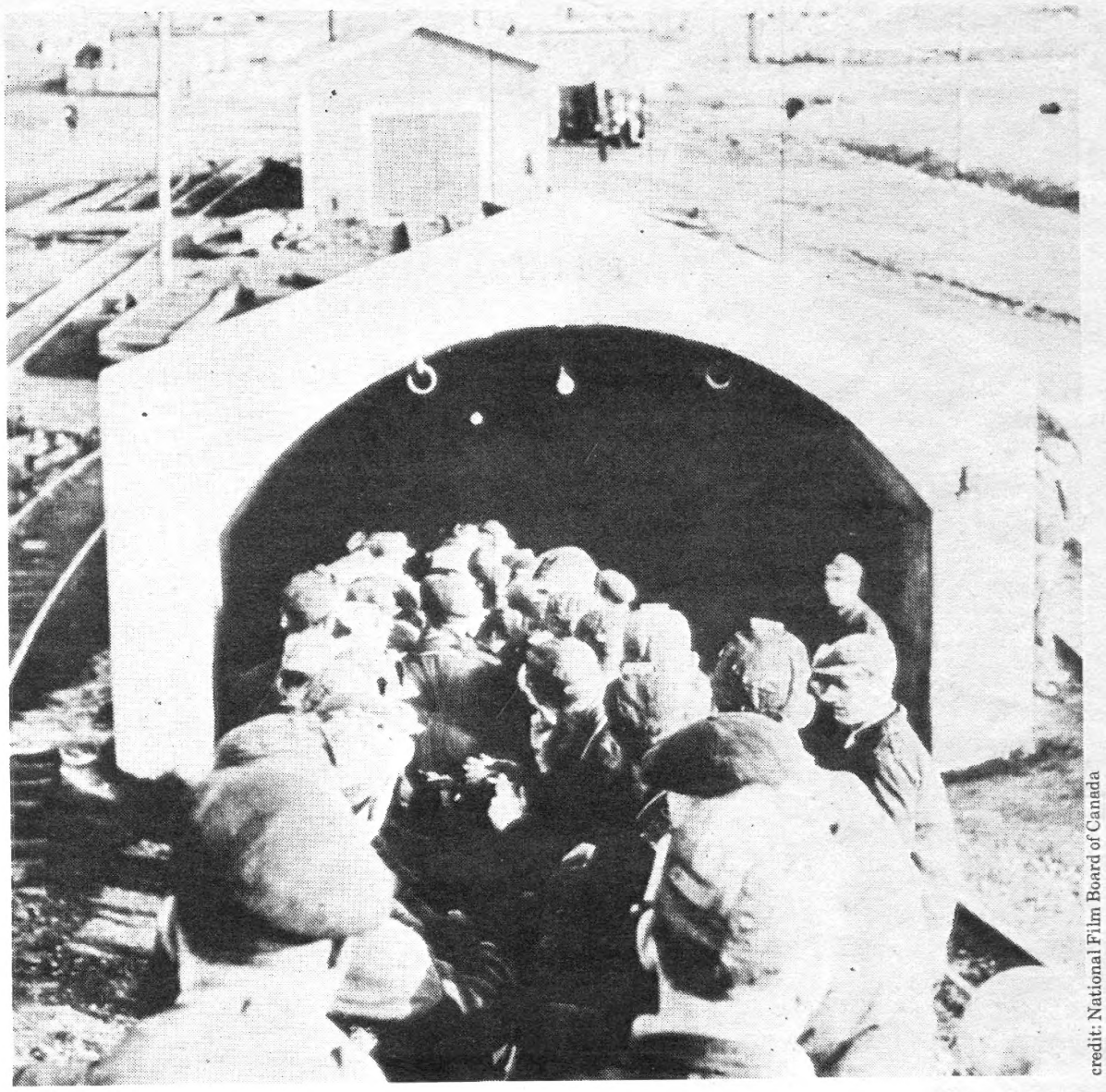
With your oil flask strapped
up to your side,
And on your back
a miner's pride,
And bold John Davis
for your guide,
Wabana you're a corker.

Down in those dark
and weary deeps,
Where the drills do hum
and the rats do squeak,
Day after day,
week after week,
Wabana you're a corker.

The boss will show you
to your room,
With a lighted lamp
will show a gloom,
And perhaps those walls
will be your tomb,
Wabana you're a corker.

In June 1966 the Bell Island mines were closed on one month's notice.

Adapted from *Bell Island* by Peter Neary, Canada's Visual History, Series 1, Volume 12, published jointly by the National Museum of Man and the National Film Board.



credit: National Film Board of Canada

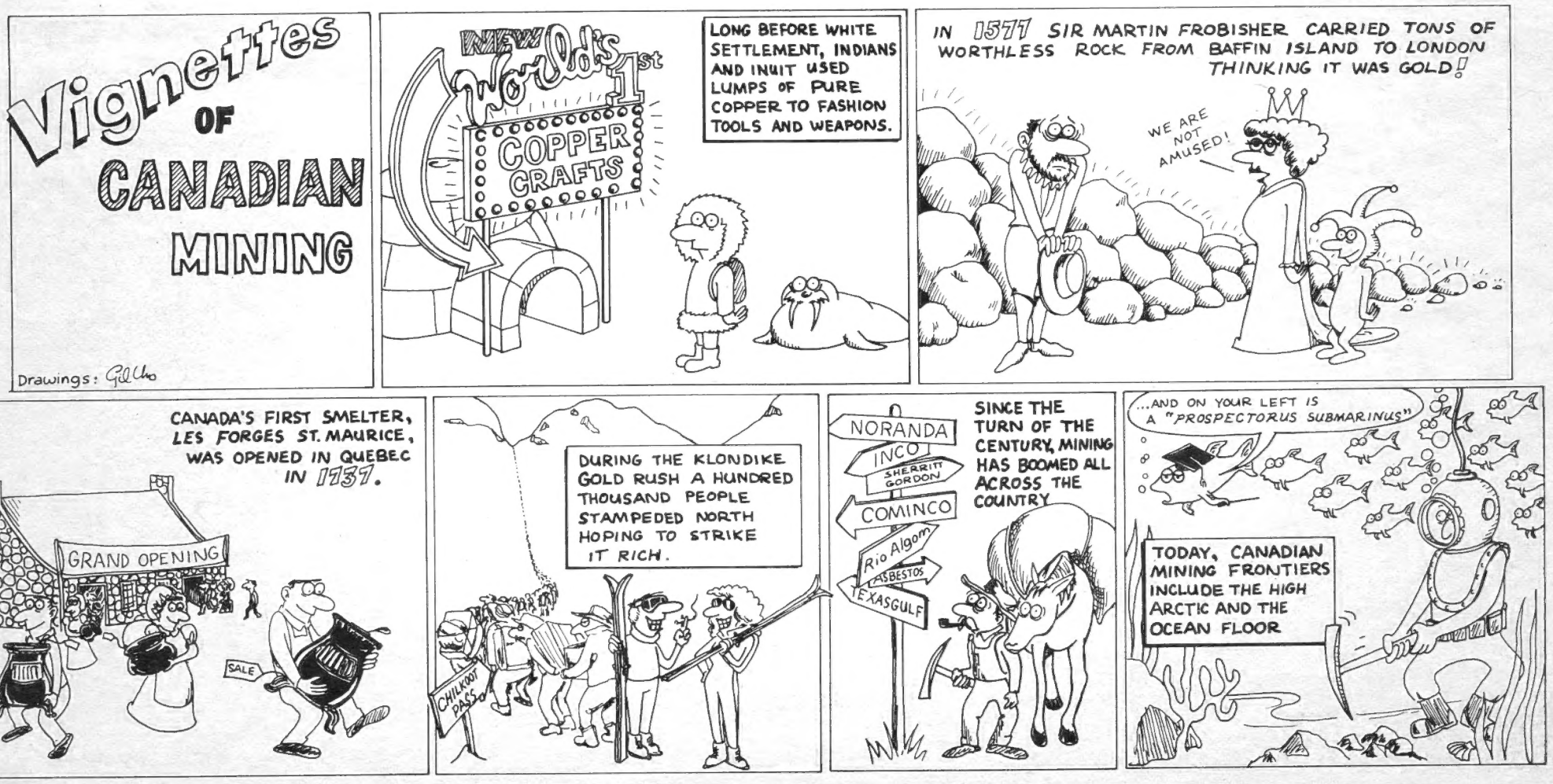
Golden Memories Continued

news of another strike reached civilization, in the region of the Klondike River, Yukon. The lure of sudden fortune tugged again at the adventurous, and another gold rush, the greatest the world has ever seen, began.

If the Caribou had seemed remote and hard to reach, the trail to the goldfields of the Yukon was even more arduous. Yet by 1898 one hundred thousand people had stampeded to that harsh land, carrying food and supplies over mountain passes and down the wild Yukon River in hand-built boats. The excitement and danger of those times has been well-recorded, and names like Dangerous Dan McGrew, the Lady That's Known as Lou, Chilkoot Pass and Bonanza Creek evoke memories of one of the most colourful events in Canadian history.

Since the end of the nineteenth century, no major placer deposits have been found in Canada. Today, most gold is mined from lode deposits and recovered by crushing the host rock and extracting the treasure. Most of these deposits are confined to the Canadian Shield, in early Precambrian rocks that are approximately two and a half billion years old.

Yet memories of the pioneer miners and their stampede for gold linger on. The pattern of settlement following a mineral discovery has been repeated many times over the years. And the image of an old sourdough with a gold pan and a pack horse remains a symbol of wilderness spirit.



ROCKHOUND'S CORNER

Who among us hasn't at some time been attracted by the special beauty of a stone at our feet and stooped to pick it up? Or left a mineral exhibit with a sense of wonder that crystals so intricate and beautiful could be locked in the rock formations we pass every day.

For many thousands of "rockhounds" across the country, the study and collection of minerals has opened doors to a new understanding of their world. As they learn to know the landscape and recognize where to find what types of rocks, they glimpse little by little the story of change in the earth. And with each new mineral specimen they gain an appreciation of the many faces of nature.

It's easy to start a mineral collection. Although geology and mineralogy courses will help you become acquainted with minerals, it's possible to get started with only a few books and very simple equipment. The rewards will be worth their weight in gold.

SOME TERMINOLOGY

The surface of the earth is made up of *rocks*. They form our mountains, lie under the fertile soil of our valleys, jut through soil to form outcrops, and even form the contours beneath the oceans.

All minerals occur within rocks. A *mineral* is a non-living, naturally occurring, chemical substance. It has a definite atomic structure and characteristic physical properties.

An *ore* is a rock from which constituents of economic value may be extracted.

WHERE TO LOOK FOR MINERALS

Every roadcut, cliff, stream, excavation or quarry exposes rocks and minerals for you to see. Learn to watch for rocky outcrops. Look for exposures along cliffs, seashores, lakes and streams; landslide areas in the mountains; or beaches and stream beds. Search for minerals in quarries, rock pits, mine workings and mine dumps. Look for man-made rockcuts along roads and railway tracks.

When looking for minerals you should always respect private property. Ask for permission before entering a mine, quarry or other property; in active mining areas make arrangements to visit well in advance.

Guides to specific mineral deposits may exist for your area, or local clubs will know of specific sites.

TOOLS AND EQUIPMENT

The essential tool for removing specimens is a geologist's hammer. You can get a chisel-edged one, which is useful for trimming and shaping specimens, or a pointed pick type. A two-pound hammer is suitable for most purposes. Where delicate crystals are to be preserved in a specimen, fewer blows with a heavier hammer and chisel will lessen the possibility of shattering. A rock chisel is necessary for separating specimens from larger rock masses. Be sure to wear safety glasses — a chip of stone or steel in the eye is extremely painful and may cause permanent damage.

Bring along some old newspapers for wrapping specimens, a notebook and pencil for recording details, a compass, a magnifying glass of about 10X, and some means for testing hardness, such as a pocket knife. Other items which are often useful in field identification are a magnet, a streak plate and a vial containing dilute hydrochloric acid. Depending on what you're looking for you may also wish to bring a gold pan, an ultraviolet lamp and a geiger counter.

Wear warm outdoor clothing, heavy gloves, and boots or shoes that will give a good grip on rocks. Bring a shoulder bag or knapsack to carry specimens, and a camera if you want to record the expedition. Remember when packing, though, that a knapsack full of rocks gets heavy!

FIELD TESTS AND IDENTIFICATION

Every mineral has certain physical properties which will help you determine its identity. Some tests are easy to do in the field, others may need to be done with more sophisticated equipment. Sometimes you may need to send a difficult mineral to a museum or university for identification using x-rays or chemical analysis.

Some simple tests will help you identify mineral specimens:

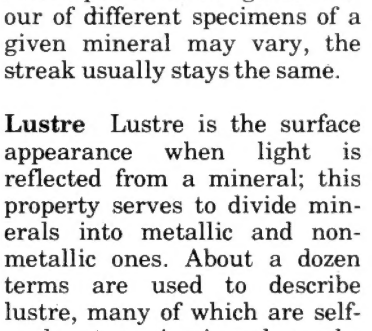
Crystal form This is the outward expression of the internal arrangement of atoms in a mineral. The symmetry of the crystals is critical in mineral identification. It is also difficult to use and requires careful study.

Cleavage This refers to the way in which some minerals split along certain smooth planes. Cleavage may range from poor (as in bornite) to eminent (as in micas).

Fracture Not all minerals show cleavage; most show fracture. This means that they break along irregular surfaces.

Hardness Hardness refers to a mineral's resistance to scratching. It is a rough way to identify minerals. A scale which lists the hardness of ten minerals, called Moh's scale, is useful.

1.	Talc	**6.**	Orthoclase
2.	Gypsum	**7.**	Quartz
3.	Calcite	**8.**	Topaz
4.	Fluorite	**9.**	Corundum
5.	Apatite	**10.**	Diamond



Grossular crystals (a species of garnet) of exceptional quality can be found at the Jeffrey mine in Asbestos, Quebec. The hessonite variety, pictured here, is popular with collectors and has been cut into beautiful gemstones.

Colour Colour reflects the way a mineral looks. In metallic ores colour is often a means of identification, but many other minerals vary a great deal in colour, or contain impurities that change their colour. Use caution with this characteristic, and check only on a freshly broken surface.

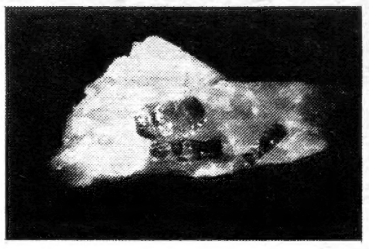
Streak Streak refers to the colour of a mineral's powder. It is best seen when the mineral is rubbed firmly against a piece of unglazed porcelain (called a streak plate). Although the colour of different specimens of a given mineral may vary, the streak usually stays the same.

Lustre Lustre is the surface appearance when light is reflected from a mineral; this property serves to divide minerals into metallic and non-metallic ones. About a dozen terms are used to describe lustre, many of which are self-explanatory. A mineral may be vitreous (glassy) like quartz, metallic, dull, greasy, silky, resinous, etc.

Specific gravity Specific gravity is the relative weight of a mineral compared with the weight of an equal volume of water.

Magnetic property This refers to the attraction of a mineral to a magnet.

Chemical composition Although chemical composition is an advanced technique for identifying minerals, certain species that contain carbon and oxygen in combination (carbonate minerals) will react with acid. When a drop of dilute hydrochloric acid is placed on calcite, the acid reacts with the calcite, resulting in the bubbling off of the gas, carbon dioxide.



Apatite is a very common mineral and may be one of the first you add to your collection. In Canada, apatite is most often found in calcite dykes. The specimen here is on calcite.

CARE OF SPECIMENS

When you are out in the field, trim specimens to a reasonable size as you collect them, wrap them individually in newspaper or tissue, and take them home in cloth sample bags. Take special care with crystals; careful packing will prevent disappointment. It is a good idea to put field labels giving locality information with each collection as it is wrapped, since details are easily forgotten.

When you get home wash the specimens carefully with detergent and water; do not use stiff brushes on soft minerals.

Label the specimens before final storage. Some collectors paint a small area of white enamel on the specimen and write an index number on it with black ink. This number can be recorded in a book or card file with the name, locality and any other information you wish to keep.

GEM COLLECTING AND CUTTING

The beauty and brilliance of gemstones has attracted people for many thousands of years. Amateurs can collect or purchase a variety of semi-precious stones which can be cut and polished to bring out their brilliance.

Although Canada has never been regarded as a source of gem materials, it has produced many popular ornamental stones of which perhaps the best known are labradorite and sodalite. The former is so typical of this country that it has been referred to as the "gem of Canada". Other minerals in this category are: jade (nephrite) from British Columbia; hessonite garnet from Ontario and Quebec; perthite and rose quartz from Ontario; and agate, chalcedony and jasper from various localities in British Columbia, Ontario and Nova Scotia. These minerals provide much of the material for amateur gem-cutters today.

A CONSERVATION NOTE

Conservation of minerals poses a real problem. Remember when you are collecting that most of our mineral specimens have existed for millions of years, long before we appeared as a species, and can never be replaced. Take only as many specimens as you need and be considerate of others who may come after you. By collecting and caring for specimens, we can enhance their beauty and inspire appreciation of our mineral heritage in others.

FOR MORE INFORMATION

For the beginning collector, books, mineral maps, local field guides, magazines, and clubs are indispensable in providing tips about where to collect and valuable information to help in identification.

There are over a hundred amateur rock and mineral clubs registered in Canada. They have meetings, field trips, exhibits etc., and are an excellent way for the novice to get started.

Identification of specimens can be difficult, even for the more advanced collector. Browsing through mineral exhibits at museums and universities will help familiarize you with different mineral species.

Some museums, provincial departments of mineral resources, and universities offer mineral identification services to the public. For example, the Mineral Sciences Division of the National Museum of Natural Sciences will identify up to five minerals per individual each time you send some in.

Also, to help amateur mineralogists identify and recognize rocks and minerals, the Geological Survey of Canada has available three sets of specimens for purchase.
For details write to:

Geological Survey of Canada
601 Booth Street
Ottawa, Ontario
K1A 0E8

Finally, for exotic minerals and crystals that you would like to purchase to add to your collection, there are mineral and lapidary dealers throughout the country.

An invaluable book for mineral collectors is called *Information for Collectors*, published by and available free of charge from the Geological Survey of Canada at the above address. This booklet lists names of books, journals and guidebooks for the collector; GSC publications; addresses for mineral and rock sets, maps, reports and identification services; the amateur mineral and rock clubs in Canada; Canadian mineral and lapidary dealers; and mineral exhibits throughout the country. It is revised annually.

(Much of the information on this page has been adapted from *Information for Collectors* 1980, published by the Geological Survey of Canada.)

One of the best ways to get started collecting minerals is to join a mineral club. Here, members of the Ottawa Valley Mineral Association look for specimens at Gutz Farm, Ontario.

Quartz is one of the most common minerals in the earth's crust. It often occurs in crystalline masses. Some of the coloured varieties of quartz include amethyst, citrine and rose quartz.